First Great Western

READING TURBO MAINTENANCE DEPOT

CLASS 165/166 TURBO

T.P.W.S.

First 165 103

TRAIN PROTECTION WARNING SYSTEM

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How it works

The system is designed to deal with two potentially dangerous situations; approaching a red signal too fast (Overspeed) and passing a red signal (Train Stop)

Overspeed. 2 track-mounted sensors detect the speed of train when approaching a red signal. If the train appears to be going too fast, such that a SPAD is highly probable, an emergency brake application is made.

Train Stop. Track sensors determine if the train is about to pass a red signal and if this is so an emergency brake application is made.

Override. In certain circumstances where a driver is authorised to pass a red signal a train stop override facility is provided. By depressing this button the train can proceed pass a red signal without the brakes applying.

Temporary Isolation. For a number of reasons it may be necessary to isolate TPWS. A facility to do this is provided in the cab, however it should be noted that operating this isolation switch does not affect the operation of the AWS system.

Full Isolation. The TPWS full isolation switch replaces the AWS isolation switch. Operating this switch isolates both the TPWS and AWS systems.

The system can operate at speeds of up to 225 km/hr.

AWS functionality remains the same.

From AWS to TPWS – The changes

- The AWS relay panel is replaced with a TPWS control panel, which also controls AWS functions.
- A TPWS Power Supply Unit is fitted in the cab roof space replacing the existing AWS converter.
- A new temporary isolation switch is fitted in the cab in addition to the TPWS full isolation switch previously known as the AWS isolation switch.
- A new TPWS indicator and override panel is fitted in the cab.
- A TPWS aerial is mounted on to the existing AWS receiver.
- The AWS reset button is renamed the TPWS reset button.

Procedures

The following procedures have been modified in order to take the installation of TPWS into account.

Job 588	Cab and Control Equipment – Check Makes reference to TPWS isolation switches.
Job 601	Bogies and Underframe Equipment – Check Makes reference to the TPWS aerial and associated components.
Job 602	Bogies and Underframe – Examine Makes reference to the TPWS aerial and associated components.
Job 304	AWS & TPWS Functional Test. New procedure.

Safety Critical Work

The testing of TPWS has been identified as a Safety Critical Work activity. All staff will, therefore, need to be assessed in the testing of TPWS.

AWS & TPWS – Functional Test

An Overview

Maintenance Job 304 has been produced to ensure both AWS and TPWS are functioning correctly. AWS has been incorporated into TPWS testing as both systems are controlled by a common control panel.

Purpose of the test.

The test is designed to test all the possible situations that both TPWS and AWS are likely to encounter.

The components that are being tested.

- AWS receiver
- Sunflower
- Horn
- Bell

- TPWS acknowledge button (previously AWS cancel button)
- Control panel (previously AWS relay panel)
- Indicator panel
- Temporary isolation switch
- Full isolation switch
- TPWS receiver.

The situations being simulated.

- AWS clear signal
- AWS caution signal – cancelled
- AWS caution signal – not cancelled

- TPWS/AWS full isolation

- TPWS Ariel sensitivity

- Train passes a signal at danger in the normal direction of travel. (Normal Direction – Train Stop)
- Train passes a signal at danger whilst driving the unit backwards. (Wrong Direction – Train Stop)
- Train travelling in the normal direction of travel passing a danger signal set for trains working from the opposite direction. I.e. on bi-directional lines (Reverse Normal Direction – Train Stop)
- Train being driven backwards encountering a danger signal set for trains working from the opposite direction. (Reverse Wrong Direction – Train Stop)

- Train travelling too fast towards a signal at danger in the normal direction of travel. (Normal Direction – Overspeed – High Speed)
- Train travelling too fast towards a signal at danger whilst driving the unit backwards. (Wrong Direction - Overspeed– High Speed)
- Train travelling at speed after passing a danger signal set for trains working from the opposite direction. I.e. on bi-directional lines (Reverse Normal Direction – Overspeed – High Speed)
- Train being driven at speed backwards after passing a danger signal set for trains working from the opposite direction. (Reverse Wrong Direction – Overspeed – High Speed)
- Train braking appropriately approaching a signal at danger in the normal direction of travel. (Normal Direction – Overspeed – Low Speed)
- Train braking appropriately approaching a signal at danger whilst driving the unit backwards. (Wrong Direction – Overspeed – Low Speed)
- Train braking appropriately after passing a danger signal set for trains working from the opposite direction. I.e. on bi-directional lines (Reverse Normal Direction – Overspeed – Low Speed)
- Train braking appropriately backwards after passing a danger signal set for trains working from the opposite direction. (Reverse Wrong Direction – Low Speed)

- Driver operates Train Stop Override button at low speed
- Driver operates Train Stop Override button at high speed

- TPWS temporary isolation

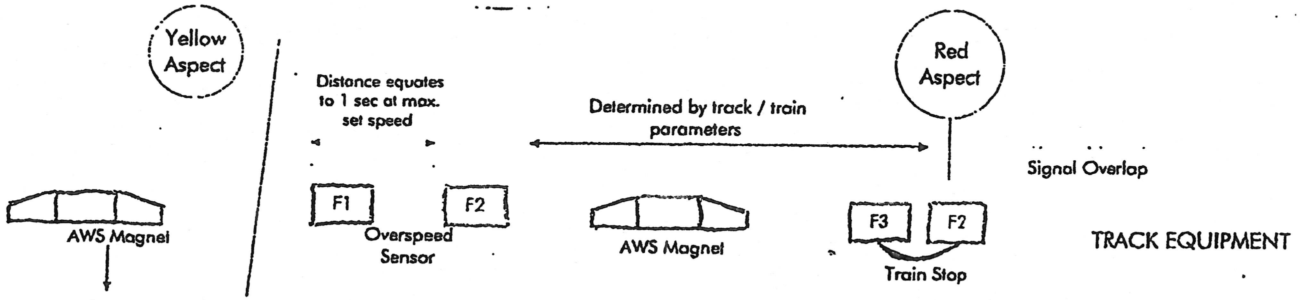
PURPOSE OF TPWS

To supplement existing AWS (Automatic Warning Systems) by an improved system, which will reduce the number and limit the effects of SPADs (Signals Passed at Danger).

OVERVIEW

TRACK

- AWS magnets remain
- TPWS equipment installed in addition comprising overspeed sensor and train stop loops sited in the 4ft.


Yellow Aspect
Distance equates to 1 sec at max. set speed
Determined by track / train parameters
Red Aspect
Signal Overlap
AWS Magnet
F1
F2
Overspeed Sensor
AWS Magnet
F3
F2
Train Stop
TRACK EQUIPMENT

VEHICLE (GENERAL)

- AWS operation and indications are unaltered.
- With exception of the removal of the AWS relay box, the AWS equipment is unchanged.
- A TPWS Control Panel will be fitted in the cab.
- A TPWS receiving aerial (Antenna) will be added to the underframe, bogie or AWS mounting bracket at the leading end of the train. This will be mounted on a new bracket fitted to the underframe traction centre, bogie or AWS mounting bracket.
- A new combined TPWS control unit will be fitted in place of the existing AWS relay box. This new control unit embraces AWS relay logic unit and operates both the existing AWS and the new TPWS systems.
- A new TPWS power supply unit will be fitted that supplies 12V and 40V DC supplies to the TPWS equipment from the vehicle battery supply.

FEATURES

TRACK EQUIPMENT

1. Track mounted equipment comprising Inductive Loops that send low frequency radio transmission signals to the train.

2. Two types of installation are required :

OVERSPEED SENSOR
Will initiate an emergency brake application if the train speed is such that there is a high probability of either a signal being passed at danger or a speed restriction being significantly exceeded.

TRAIN STOP
Will initiate an emergency brake application if a train passes a red signal without authority.

EACH OF THE ABOVE DEVICES COMPRISE TWO LOOPS

TRAIN EQUIPMENT

1. The trainborne equipment receives these signals via a new bogie mounted aerial (antenna) and determines whether a brake application is to be initiated.
2. The TPWS system also accepts the signals from the existing AWS receiver. The system operates the existing conventional AWS equipment; Alarm and Indicator Unit or Indicator Unit, bell and Yodalarm or Indicator Unit, bell and horn.

OPERATION OF TPWS

PRINCIPLES

AWS (Similar to the existing systems although now controlled by TPWS)

- Indicates when clear (green) signal is approached, by sounding a bell.
- When approaching either a double yellow, yellow or red signal a horn in the cab provides an audible indication to the driver.
- Will apply brakes, if not acknowledged within 2.7 seconds.
- AWS Indicator (Sunflower) provides a reminder to the driver of the status of last signal passed.

TPWS (NEW SYSTEM)

In addition to AWS indications above;

- When approaching a red signal, overspeed sensor will apply brakes if train speed exceeds a pre-determined value at the location of the overspeed sensor (set by spacing between loops).
- If the train passes a signal at danger (Red), the TPWS will initiate an emergency brake application as the vehicle passes over the "train stop" loops sited just in front of the signal post.

Diagram Showing TPWS Operation (including AWS)

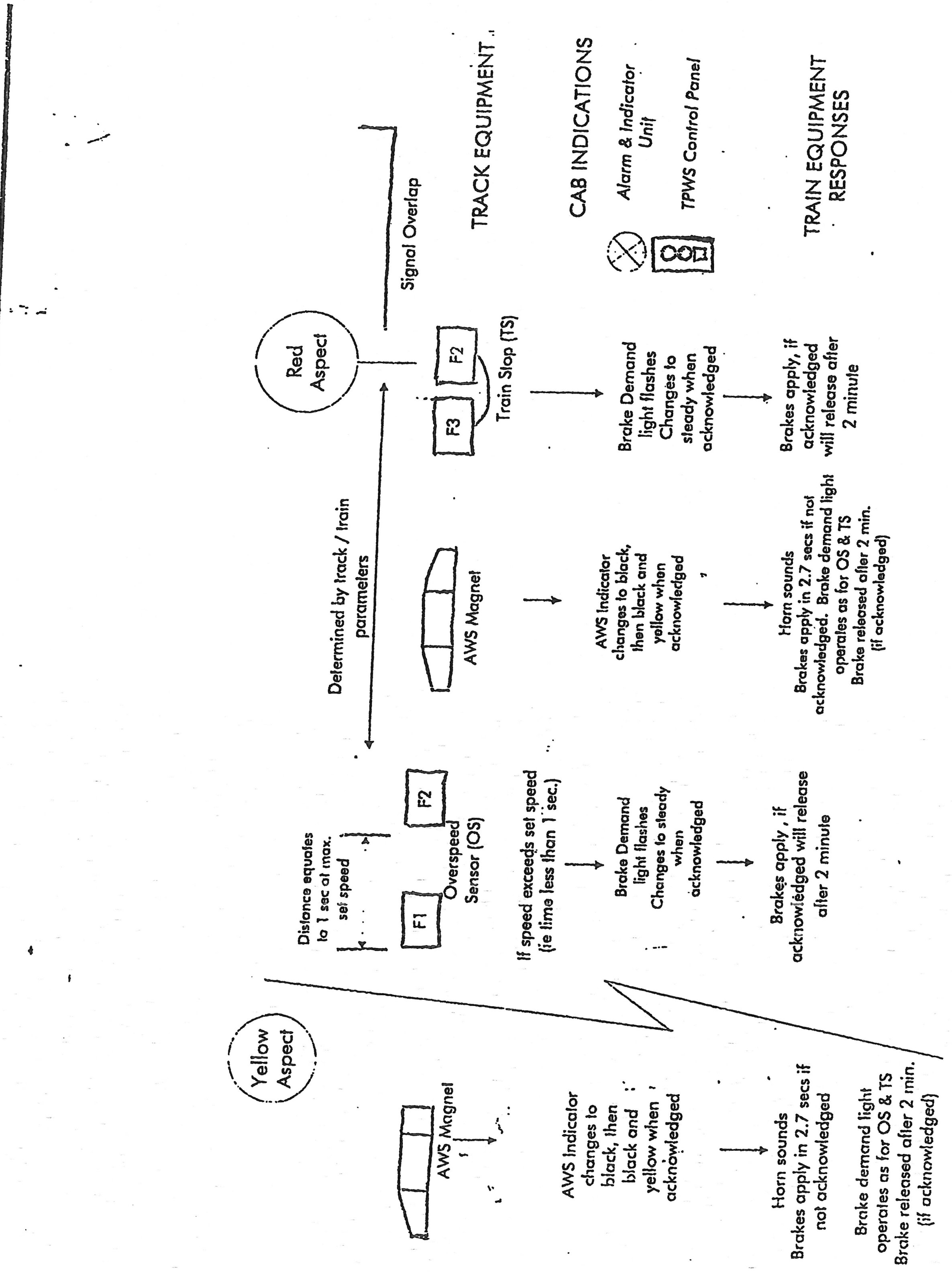

Yellow Aspect
AWS Magnet
AWS Indicator changes to black, then black and yellow when acknowledged
Horn sounds
Brakes apply in 2.7 secs if not acknowledged
Brake demand light operates as for OS & TS
Brake released after 2 min. (if acknowledged)
Distance equates to 1 sec at max. set speed
F1
F2
Overspeed Sensor (OS)
If speed exceeds set speed (ie time less than 1 sec.)
Brake Demand light flashes Changes to steady when acknowledged
Brakes apply, if acknowledged will release after 2 minute
Determined by track / train parameters
AWS Magnet
AWS Indicator changes to black, then black and yellow when acknowledged
Horn sounds
Brakes apply in 2.7 secs if not acknowledged. Brake demand light operates as for OS & TS
Brake released after 2 min. (if acknowledged)
Red Aspect
F3
F2
Train Stop (TS)
Brake Demand light flashes Changes to steady when acknowledged
Brakes apply, if acknowledged will release after 2 minute
Signal Overlap
TRACK EQUIPMENT
CAB INDICATIONS
Alarm & Indicator Unit
TPWS Control Panel
TRAIN EQUIPMENT RESPONSES

Diagram Showing TPWS System (including AWS)

OVERSPEED SENSOR

Purpose: Apply brakes if a train approaches a signal at danger at such a speed that there is a high probability of a SPAD occurring.

How it works: Measures (on the train), time taken to pass between two points (loops) on the track.

If the time is less than a pre-set time (nominally 1 second) brakes apply. This indicates the vehicle is travelling too fast at that point in time.

The system will only activate when the signal controlling the overspeed sensor is showing red.

TRAIN STOP

Purpose: To apply brakes on a train that passes a signal at danger, without authority.

How it works: Operates independently of overspeed sensor, but on a similar principle. Train stop loops however, are mounted near to the controlling signal and are physically closer to each other.

Unless overridden by Train Stop Override facility, always applies brakes if signal is showing red.

Note: If the signal has an associated subsidiary signal, the train stop loops will be disabled when the subsidiary aspect shows proceed.

TRAIN STOP - OVERRIDE FACILITY

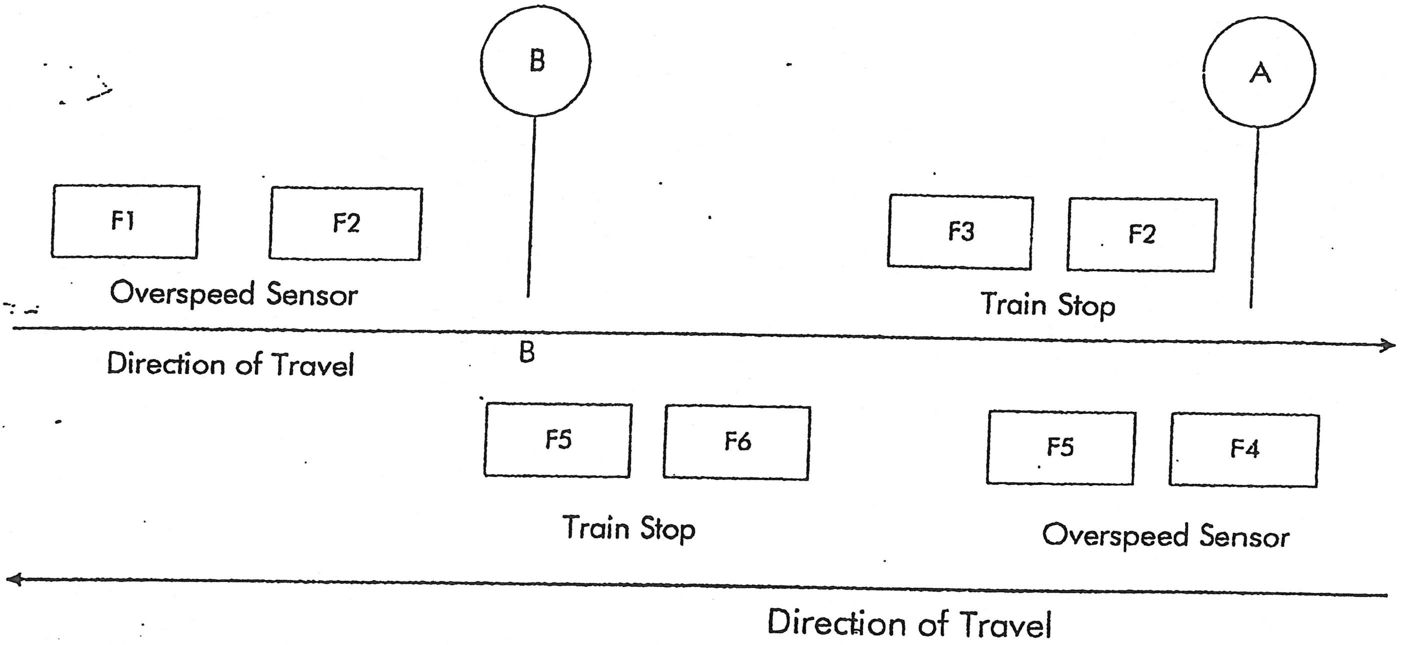
Purpose: Allow train to pass a red signal when authorised.

How it works: To activate the system, the driver presses the Train Stop Override Switch before passing the train stop loops (This will prevent a brake application).
The Train Stop Override will "time out" after 20 seconds (60 seconds for freight locos).

Note: Override Time cannot be extended by multiple presses.

BI-DIRECTIONAL WORKING/SINGLE LINES

In order to enable the equipment to differentiate between loops for the different signals / directions of travel, different frequencies are used.


B
A
F1
F2
Overspeed Sensor
F3
F2
Train Stop
Direction of Travel
B
F5
F6
F5
F4
Train Stop
Overspeed Sensor
Direction of Travel

Signal A controls train movements left to right and
- overspeed sensor F1 + F2
- train stop F3 +F2

Signal B controls train movements right to left and
- overspeed sensor F4 + F5
- train stop F6 + F5

TEMPORARY ISOLATION

When it is necessary to temporarily disable TPWS, (e.g. when propelling or in the event of a TPWS related equipment failure), this is achieved by operating the Temporary Isolation Switch located in the cab behind the hinged panel above the driver's windscreen. This disables the train stop and overspeed sensor functions but allows all AWS functions to operate normally.

If the Temporary Isolation switch is operated whilst TPWS has applied the brakes, the brakes will not be released immediately. Only after the normal 1 minute has elapsed will the brakes be released.

BRIEF TECHNICAL DESCRIPTION

The system can operate at speeds of up 225 km/hr and different train configurations from high speed trains to freight trains.

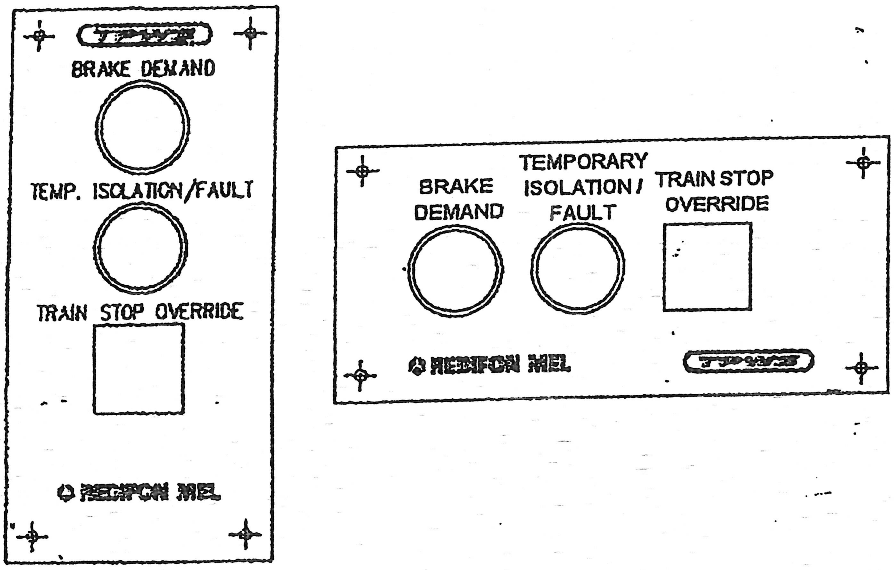
The new control unit is supplied by 12V and 40V DC from the TPWS Power Supply Unit. The TPWS Power Supply Unit is fed from vehicle battery supply.

Full isolation of TPWS (including AWS functions) is achieved by operating the TPWS isolation switch – formerly AWS isolation switch.

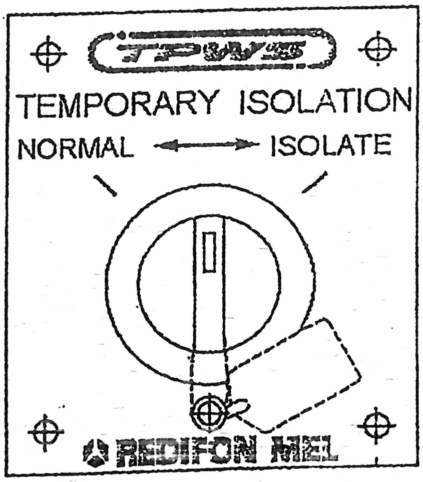
The Temporary Isolation Switch only isolates the TPWS functions.

The control unit has facilities to interface with DSD and Data Recording equipment.

Control Panel


TPWS
BRAKE DEMAND
TEMP. ISOLATION/FAULT
TRAIN STOP OVERRIDE
REDIFON MEL
BRAKE DEMAND
TEMPORARY ISOLATION / FAULT
TRAIN STOP OVERRIDE
REDIFON MEL
TPWS

Temporary Isolation Switch


TPWS
TEMPORARY ISOLATION
NORMAL
ISOLATE
REDIFON MEL

TYPICAL TIME SETTINGS

NOTE: Time settings may vary between vehicle types.

Overspeed Sensor Link

0.974 secs time setting

PL2	TERMINALS		LINKS FITTED
(MKII Box)	(MKIII Box)		*YES / NO*
L to K	*33 to 36*	-	*Yes*
M to N	*33 to 37*	-	*No*
P to R	*33 to 38*	-	*Yes*

1.218 secs time setting

PL2	TERMINALS		LINKS FITTED
(MKII Box)	(MKIII Box)		*YES / NO*
L to K	*33 to 36*	-	*No*
M to N	*33 to 37*	-	*No*
P to R	*33 to 38*	-	*Yes*

AWS Acknowledgement Timing Link

Link fitted between terminals 33 & 35 gives 2.7 secs acknowledgement time
No link fitted between terminals 33 & 35 gives 2 secs acknowledgement time.

Train Stop Override Timing Link

No link fitted between PL2 S to T (MKII Terminal Box) or terminals 33 & 34 (MKIII Terminal Box) gives 20 secs period to traverse train stop loops.
Link fitted between PL2 S to T (MKII Terminal Box) or terminals 33 & 34 (MKIII Terminal Box) gives 60 secs period to traverse train stop loops.

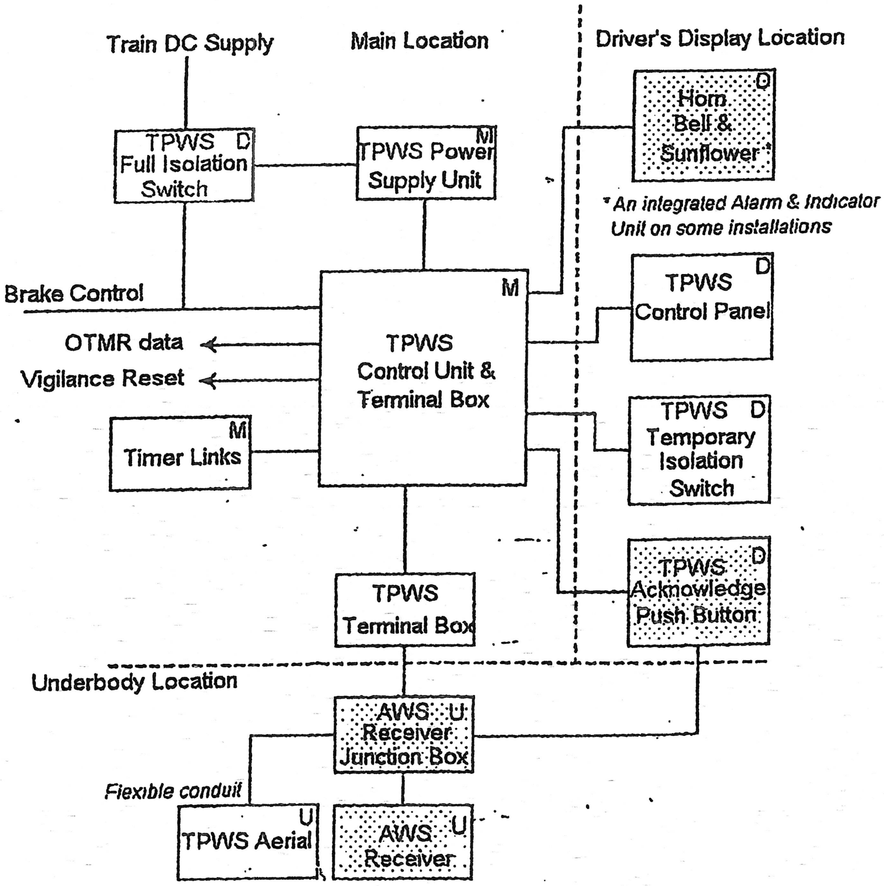
TRAINBORNE EQUIPMENT

Introduction

The trainborne system consists of the TPWS Control Unit, connected to the AWS ancillaries (comprising the AWS Receiver, Alarm and Indicator Unit and TPWS Acknowledge Push-button) and to the TPWS ancillaries (comprising the TPWS Aerial, TPWS Control Panel and TPWS Temporary Isolation Switch). The whole system is powered by the TPWS Power Supply Unit which is connected to the train DC supply via the TPWS Full Isolation Switch.

Figure 5 is a block diagram of the trainborne installation. The items shown shaded form part of the existing AWS System to which the new TPWS equipment interfaces. The letter in each block (M, D or U) indicates the location of that item on the unit as described below:

M	Main location: This houses the TPWS Control Unit and the Power Supply Unit. This location is normally in the driver's cab ceiling and is not normally accessible to the driver.
D	Driver's display location: This is the location of all the TPWS and AWS controls and indicators in the driver's cab. All controls and indicators except the Full Isolation and Temporary Isolation switches are within reach of the driver.
U	Underframe location: This is the location of the AWS Receiver and the TPWS Aerial mounted on the bogie, and the AWS Junction Box mounted on the underframe adjacent to the bogie.


Train DC Supply
Main Location
Driver's Display Location
Horn Bell & Sunflower* D
*An integrated Alarm & Indicator Unit on some installations
TPWS Full Isolation Switch D
TPWS Power Supply Unit M
Brake Control
OTMR data
Vigilance Reset
TPWS Control Unit & Terminal Box M
Timer Links M
TPWS Control Panel D
TPWS Temporary Isolation Switch D
TPWS Acknowledge Push Button D
TPWS Terminal Box
Underbody Location
AWS Receiver Junction Box U
Flexible conduit
TPWS Aerial U
AWS Receiver U

Trainborne System Block Diagram

APPENDIX D

TPWS Fault Finding Guide

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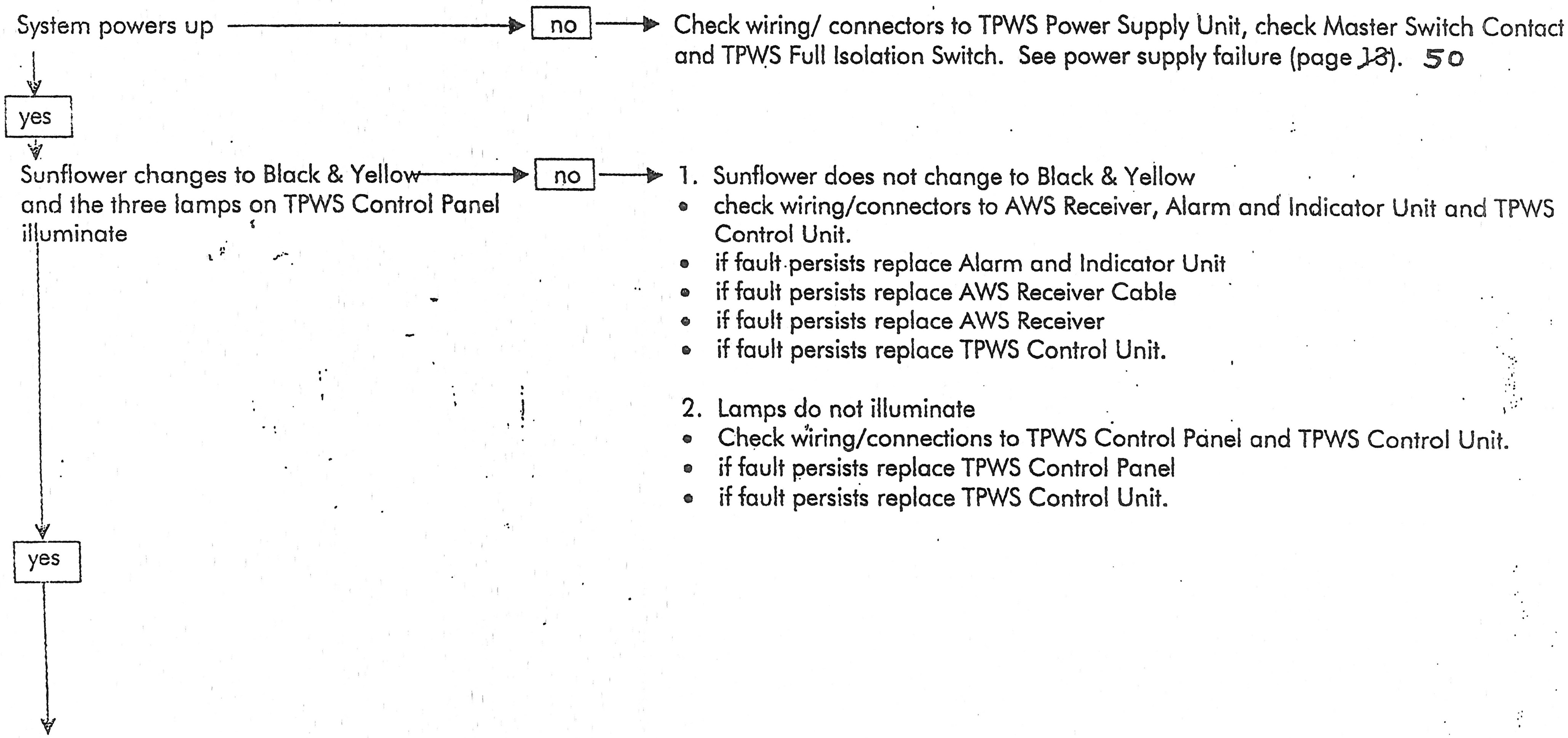
TPWS Fault Finding Guide

TPWS Power Up Test



System powers up → no → Check wiring/ connectors to TPWS Power Supply Unit, check Master Switch Contact and TPWS Full Isolation Switch. See power supply failure (page ~~13~~). 50

yes

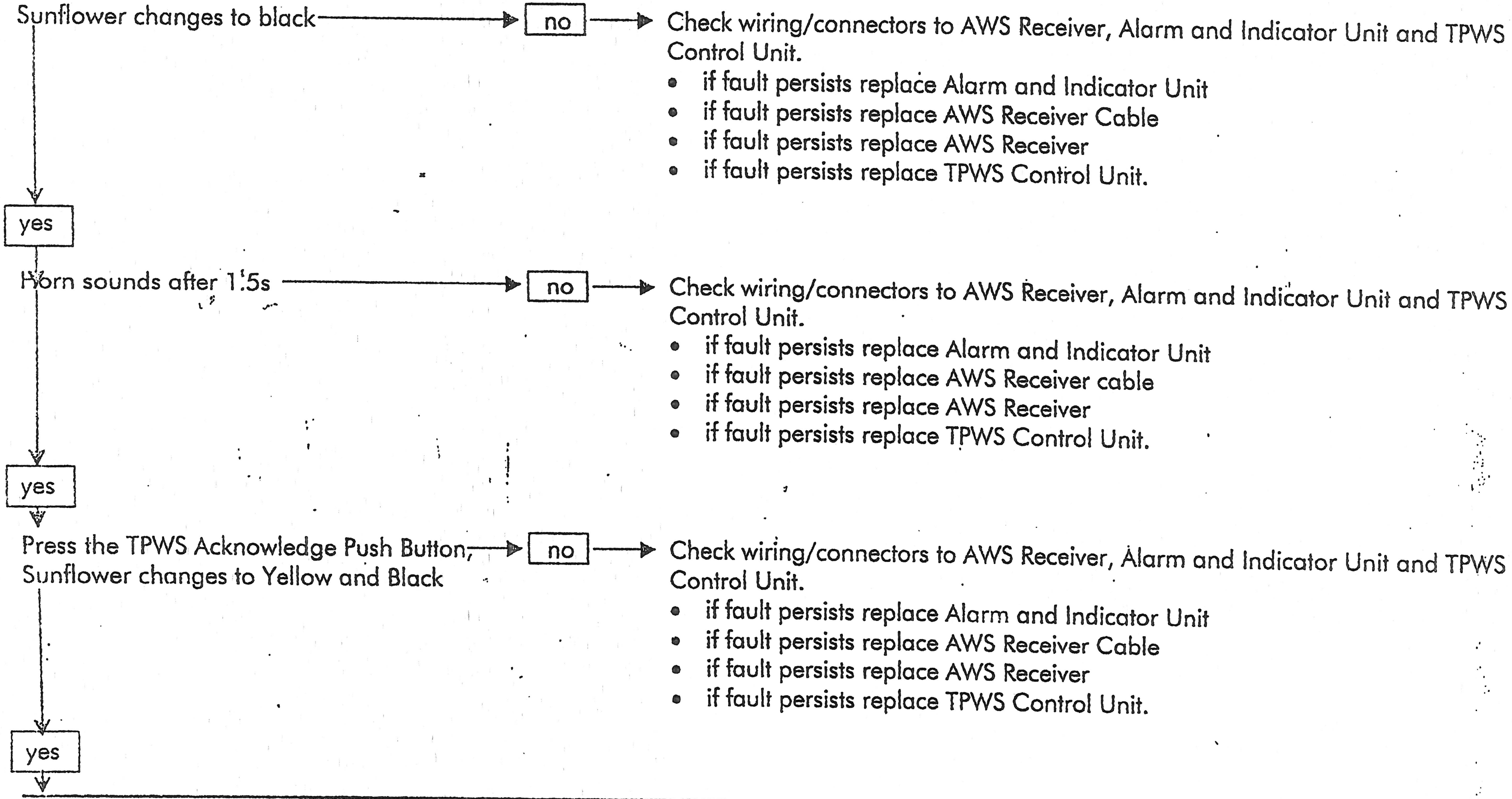
Sunflower changes to Black & Yellow and the three lamps on TPWS Control Panel illuminate → no →

1. Sunflower does not change to Black & Yellow
- check wiring/connectors to AWS Receiver, Alarm and Indicator Unit and TPWS Control Unit.
- if fault persists replace Alarm and Indicator Unit
- if fault persists replace AWS Receiver Cable
- if fault persists replace AWS Receiver
- if fault persists replace TPWS Control Unit.

2. Lamps do not illuminate
- Check wiring/connections to TPWS Control Panel and TPWS Control Unit.
- if fault persists replace TPWS Control Panel
- if fault persists replace TPWS Control Unit.

yes

TPWS Power Up Test (cont.)



Sunflower changes to black

no

Check wiring/connectors to AWS Receiver, Alarm and Indicator Unit and TPWS Control Unit.
- if fault persists replace Alarm and Indicator Unit
- if fault persists replace AWS Receiver Cable
- if fault persists replace AWS Receiver
- if fault persists replace TPWS Control Unit.

yes

Horn sounds after 1.5s

no

Check wiring/connectors to AWS Receiver, Alarm and Indicator Unit and TPWS Control Unit.
- if fault persists replace Alarm and Indicator Unit
- if fault persists replace AWS Receiver cable
- if fault persists replace AWS Receiver
- if fault persists replace TPWS Control Unit.

yes

Press the TPWS Acknowledge Push Button, Sunflower changes to Yellow and Black

no

Check wiring/connectors to AWS Receiver, Alarm and Indicator Unit and TPWS Control Unit.
- if fault persists replace Alarm and Indicator Unit
- if fault persists replace AWS Receiver Cable
- if fault persists replace AWS Receiver
- if fault persists replace TPWS Control Unit.

yes

TPWS Power Up Test (cont.)

Release the TPWS Acknowledge Push Button, horn stops and three lamps on TPWS Control Panel go out → no →

1. Horn does not stop
- Check that TPWS Acknowledge Push Button is not being held down.
- Check wiring/connectors to TPWS Push Button, Alarm and Indicator Unit and TPWS Control Unit.
- If fault persists replace TPWS Control Unit.

2. Lamps do not go out
- Check wiring/connectors to AWS Receiver, TPWS Control Unit and TPWS Powe Supply Unit.
- if fault persists replace AWS Receiver Cable
- if fault persists replace AWS Receiver
- if fault persists replace TPWS Control Unit
- if fault persists see Power Supply Failure (page ~~13~~). 50

3. Temporary Isolation/Fault Lamp Flashes
- Check wiring/connectors to TPWS Aerial and TPWS Control Unit.
- if fault persists replace TPWS Aerial
- if fault persists replace TPWS Aerial Flexible Conduit
- if fault persists replace TPWS Control Unit.

yes

Brakes release → no → Check wiring/connectors at TPWS Control Unit, if fault persists replace TPWS Control Unit.

yes

Power up test okay

AWS Test – Simulation of Clear Signal

Sunflower changes to black and bell sounds → No →

1. If Sunflower changes to black and horn sounds check wiring/connectors at AWS Receiver, TPWS/AWS Junction Box and TPWS Control Unit. If fault persists replace AWS Receiver.

2. If Sunflower does not change to all black, but bell sounds correctly:-
- Check wiring/connectors at AWS Receiver, Alarm and Indicator Unit and TPWS Control Unit
- If fault persists replace Alarm and Indicator Unit.
- If fault persists replace AWS Receiver
- If fault persists replace TPWS Control Unit.

3. If Sunflower changes to black, but bell does not sound:-
- Check wiring/connectors at Alarm and Indicator Unit and TPWS Control Unit.
- If fault persists replace Alarm and Indicator Unit.
- If fault persists replace TPWS Control Unit.

yes → Test Okay

AWS Test – Simulation of Restrictive Signal

Sunflower changes to black, horn sounds. When acknowledged Sunflower changes to black and yellow, the horn stops and there is no Brake Demand

no

1. If horn does not sound and no Brake Demand occurs:-
- Check wiring/connectors at Alarm and Indicator Unit, AWS Receiver and TPWS Control Unit.
- If fault persists replace AWS Receiver Cable
- If fault persists replace AWS Receiver
- If fault persists replace TPWS Control Unit.

2. If horn sounds but cannot be cancelled:-
- Check wiring/connectors at Alarm and Indicator Unit, AWS Receiver TPWS Control Unit and TPWS Acknowledge Push Button.
- If fault persists replace Alarm and Indicator Unit
- If fault persists replace AWS Receiver
- If fault persists replace TPWS Acknowledge Push Button

3. If horn sounds but when acknowledged does not change to black and yellow
- Check wiring/connectors at Alarm and Indicator Unit, AWS Receiver and TPWS Control Unit
- If fault persists replace Alarm and Indicator Unit
- If fault persists replace AWS Receiver
- If fault persists replace TPWS Control Unit.

4. If horn does not sound but when acknowledged Sunflower changes to black and yellow:-
- Check wiring/connectors at Alarm and Indicator Unit, AWS Receiver and TPWS Control Unit
- If fault persists replace Alarm and Indicator Unit
- If fault persists replace TPWS Control Unit

yes

AWS Test – Simulation of Restrictive Signal (cont.)

Sunflower changes to black, horn sounds. Brake Demand occurs and Brake Demand Indicator flashes. When acknowledged Sunflower changes to black and yellow, horn stops Brake Demand Indicator changes to steady then goes out after approximately 60 secs.

no

1. If horn does not sound and Brake Demand then occurs:-
- Check wiring/connectors at Alarm Indicator Unit, AWS Receiver and TPWS Control Unit
- If fault persits replace Alarm Indicator Unit
- If fault persits replace TPWS Control Unit.

2. If horn not sound and no Brake Demand occurs:-
- Check wiring/connectors at Alarm Indicator Unit, AWS Receiver and TPWS Control Unit
- If fault persists replace AWS Receiver Cable
- If fault persists replace AWS Receiver
- If fault persists replace TPWS Control Unit

yes

Brakes release

no

Check wiring/connectors at TPWS Control Unit, if fault persists replace TPWS Control Unit

yes

Test okay

TPWS Functional Test - Train Stop Tests Forward

Brake Demand indicator flashes. → no →

Brake Demand occurs. When acknowledged Brake Demand Indicator changes to steady then goes out after 60secs.

1. If Brake Demand Indicator does not illuminate
   - Check wiring/connectors at TPWS Control Panel and TPWS Control Unit
   - If fault persists replace TPWS Control Panel
   - If fault persists replace TPWS Control Unit

2. If Brake Demand does not occur
   - Check wiring/connectors at TPWS Aerial, TPWS Junction Box and TPWS Control Panel
   - If fault persists replace TPWS Aerial
   - If fault persists replace TPWS Flexible Conduit
   - If fault persists replace TPWS Control Unit

3. If Brake Demand Indicator does not go out after 60secs
   - Check wiring/connectors at TPWS Acknowledge Push Button, TPWS Control Pane and TPWS Control Unit
   - If fault persists replace TPWS Control Unit

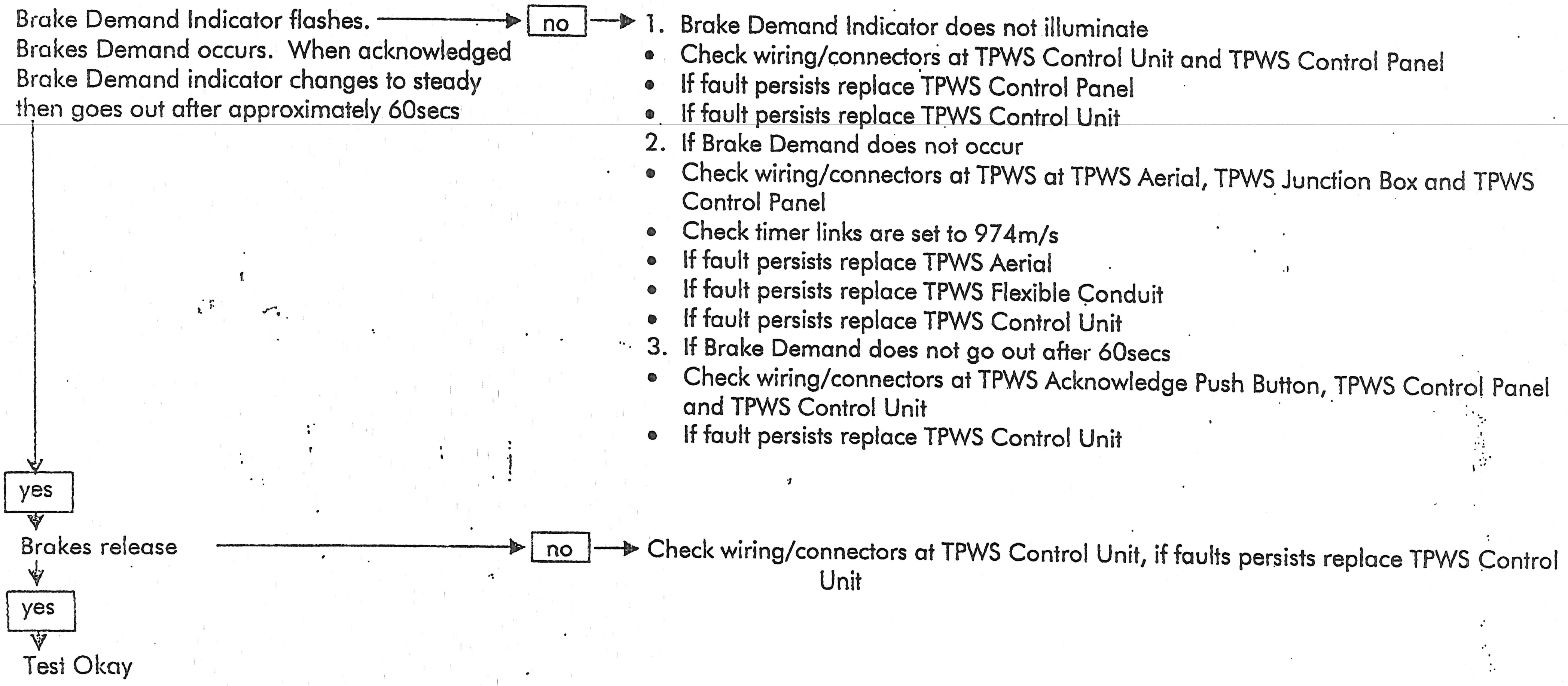
↓ yes

Brakes release → no → Check wiring/connectors at TPWS Control Unit, if fault persists replace TPWS Contrc Unit

↓ yes

Test okay

TPWS Functional Test – Overspeed Sensor Tests (High speed forward)



Brake Demand Indicator flashes. Brakes Demand occurs. When acknowledged Brake Demand indicator changes to steady then goes out after approximately 60secs

1. Brake Demand Indicator does not illuminate
- Check wiring/connectors at TPWS Control Unit and TPWS Control Panel
- If fault persists replace TPWS Control Panel
- If fault persists replace TPWS Control Unit

2. If Brake Demand does not occur
- Check wiring/connectors at TPWS at TPWS Aerial, TPWS Junction Box and TPWS Control Panel
- Check timer links are set to 974m/s
- If fault persists replace TPWS Aerial
- If fault persists replace TPWS Flexible Conduit
- If fault persists replace TPWS Control Unit

3. If Brake Demand does not go out after 60secs
- Check wiring/connectors at TPWS Acknowledge Push Button, TPWS Control Panel and TPWS Control Unit
- If fault persists replace TPWS Control Unit

Brakes release

Check wiring/connectors at TPWS Control Unit, if faults persists replace TPWS Control Unit

Test Okay

TPWS Functional Test – Train Stop Tests Reverse

Brake Demand Indicator remains out and no Brake Demands occurs → no → Check wiring connectors at TPWS Aerial, TPWS Junction Box and TPWS Control Pane if faults persists replace TPWS Control Unit

↓

yes

↓

Test okay

TPWS Functional Test – Overspeed Sensor Tests (High speed reverse and low speed forward)

Brake Demand Indicator remains out and no Brake Demand occurs → no → Check wiring connectors at TPWS Aerial, TPWS Junction Box and TPWS Control Panel
Check timer links are set to 974m/s and are not open circuit.
If fault persists replace TPWS Control Unit.

↓ yes ↓

Test okay

TPWS Functional Test – Train Stop Override - Time Out

Train Stop Override Lamp lights up and goes out again after 20secs → no → Check wiring/connectors at TPWS Control Panel and TPWS Control Unit.

- If fault persits replace TPWS Control Panel.
- If faults persist replace TPWS Control Unit.

↓ yes ↓

Test okay

TPWS Functional Test – Train Stop Override – Train Stop

Train Stop Override Lamp lights up, Train Stop Override Lamp goes out and no Brake Demand occurs → no → Check wiring/connectors at TPWS Control Panel and TPWS Control Unit.
If fault persists replace TPWS Control Unit.

↓ yes ↓

Test okay

TPWS Functional Test – Train Stop Override – Overspeed Sensor

Train Stop Override Lamp lights up, Brake Demand lamp starts flashing, Brake Demand occurs. When acknowledged Brake Demand Lamp changes to steady. Train Stop Override Lamp goes off after 20secs and Brake Demand Lamp goes off approximately 60secs after starting to flash. → no → Check wiring/connectors at TPWS Control Panel, TPWS Acknowledge Push Button, and TPWS Control Unit. If fault persists replace TPWS Control Unit.

↓

yes

↓

Brakes release → no → Check wiring/connectors at TPWS Control Unit, if faults persists replace TPWS Contro Unit

↓

yes

↓

Test okay

TPWS Functional Test – Temporary Isolation

Brake Demand Lamp remains OFF, Temporary Isolation Lamp remains ON and no Brake Demand occurs → no → Check wiring/connectors at TPWS Temporary Isolated Switch, TPWS Control Panel and TPWS Control Unit.

- If faults persist replace TPWS Temporary Isolation Switch.
- If faults persist replace TPWS Control Unit.

↓

yes

↓

Test okay

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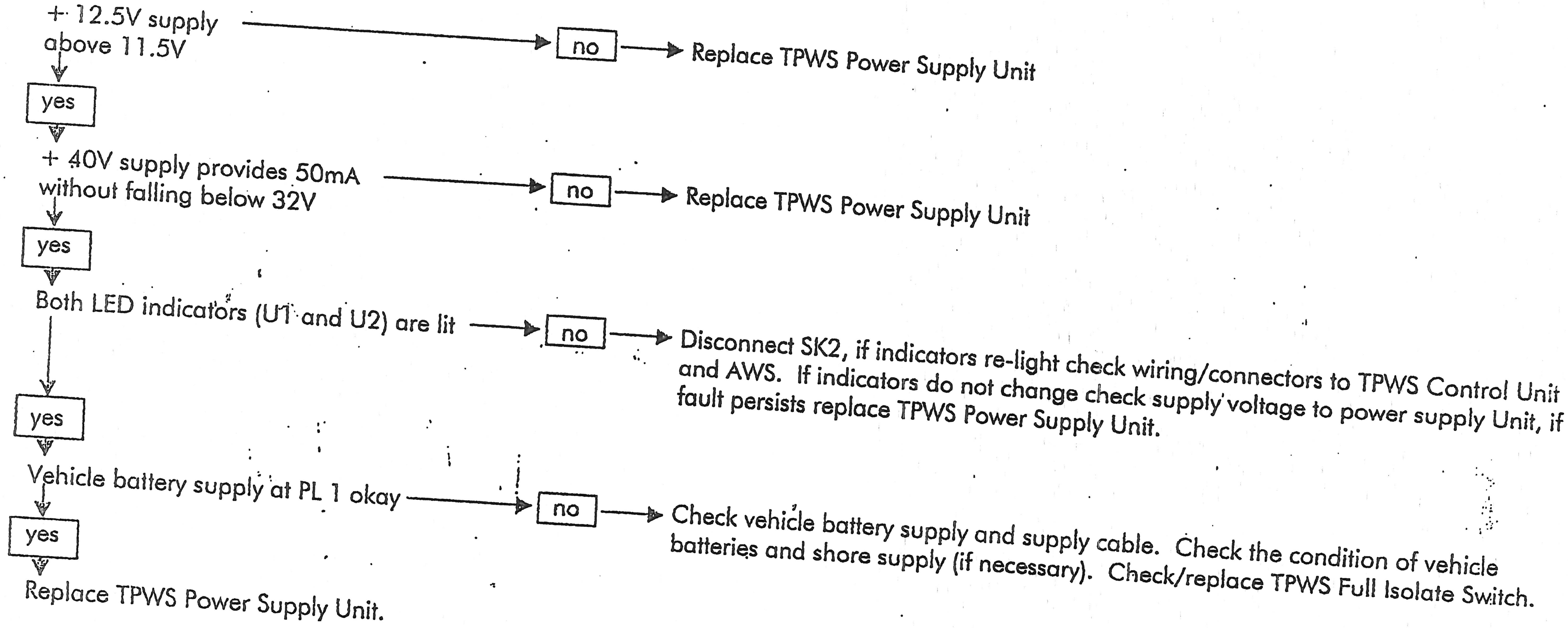
TPWS Power Supply Failure



+ 12.5V supply above 11.5V

Replace TPWS Power Supply Unit

+ 40V supply provides 50mA without falling below 32V

Replace TPWS Power Supply Unit

Both LED indicators (U1 and U2) are lit

Disconnect SK2, if indicators re-light check wiring/connectors to TPWS Control Unit and AWS. If indicators do not change check supply voltage to power supply Unit, if fault persists replace TPWS Power Supply Unit.

Vehicle battery supply at PL 1 okay

Check vehicle battery supply and supply cable. Check the condition of vehicle batteries and shore supply (if necessary). Check/replace TPWS Full Isolate Switch.

Replace TPWS Power Supply Unit.